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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/004,152	10/24/2001	Jack A. Mandelman	FIS920010265US1(14912)	8522

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EXAMINER
BLUM, DAVID S

ART UNIT	PAPER NUMBER
2813	10

DATE MAILED: 02/25/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/004,152	MANDELMAN ET AL.	
	Examiner	Art Unit	
	David S Blum	2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 February 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *10 September 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

This action is in response to Amendment B, paper #9, filed 02/11/03.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-3, 5-14, and 16-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Verret (US005298450A) in view of Chan)US006207534B1).

Verret teaches all of the positive steps of claims 1-3, 5-14, and 16-20 except for using a single mask for defining apertures (trenches) and having trench isolation sidewalls aligned to the outer edges of the top patterned mask layer. Verret forms a pad oxide 32 (by deposition or thermal operations, column 3 lines 47-49) layer on silicon (silicon semiconductor substrate as in claims 2 and 13) substrate 30, and (pad) nitride layer (34) by deposition (column 3 lines 51-53) on the oxide layer forming a mask layer. Photoresist 36 is formed on the nitride layer and patterned (lithography) and then the mask is etched to form openings on the substrate (column 3 lines 61-63 (thus the mask is formed by deposition, lithography and etching) to expose an area of the substrate.

The block mask (photoresist) is removed and a second photoresist is formed and patterned) column 4 lines 1-12). The substrate is etched by reactive-ion etching (RIE, column 4 lines 13-15) as in claims 9 and to form trench 46. After the first trench etch, the photoresist is removed from selected areas (column 4 lines 30-31 and figure 5) and a second trench is etched by methods similar to the first etch (thus RIE). Verret teaches that "trench 46 is preferably etched to a depth somewhat less than eventually desired, as a subsequent etch to be described below is effective to extend the trench deeper into substrate 30" (column 4 lines 26-29). Thus Verret teaches deepening the first trench simultaneously with the formation of the second trench (also see column 4 lines 39-40).

Regarding claims 10 and 11, where a third area is masked an then exposed to form a third set of trenches, this is essentially a repetition of the steps Verret uses to form the second set of trenches. Once the process has been taught, the repetition of the process is obvious. The mere duplication of parts, or in this case the duplication of process steps to form the duplicate parts does not represent novelty, but rather, once Verret teaches the process for forming a trench, its duplication is obvious.

In re Harza, 274 F.2d 669, 124 USPQ 378 (CCPA 1960) (Claims at issue were directed to a water-tight masonry structure wherein a water seal of flexible material fills the joints which form between adjacent pours of concrete. The claimed water seal has a "web" which lies perpendicular to the workface and in the joint, and a plurality of "ribs" which are parallel to the workface, forming the following shape:

The prior art disclosed a flexible water stop for preventing passage of water between masses of concrete in the shape of a plus sign (+). Although the reference did not disclose a plurality of ribs, the court held that mere duplication of parts has no patentable significance unless a new and unexpected result is produced.).

The trenches are filled with deposited isolation material (un-doped polysilicon 62) and planarized (column 5 lines 24-26 and 41-42). Although Verret does not explicitly teach a plurality of each aperture, one would argue that alluding to different isolation trenches for different type circuits suggests a plurality, if not in each circuit then by the plurality of circuits. One skilled in the art would know that a plurality of trenches are formed in a substrate simultaneously. This is a duplication of parts as cited above.

Verret has a top patterned masking layer (resist 36) that exposes a portion of the pad stack (figure 2). Exposed portions of the pad stack are removed to expose portions of the substrate abutting a patterned mask layer (42) as in figures 3 and 4 to form the first apertures. A portion of the mask layer covers part of the pad stack sidewalls, but this is not precluded from the claims as written. Then a portion of the block mask is removed over a second area of the pad stack layer, exposed portions of the pad stack are removed to expose portions of the substrate abutting the second patterned mask layer (42) as in figure 5 to form the second apertures.

Verret teaches this method as a process to "reduce the complexity of the overall process (column 2 lines 1-2).

Chan teaches a mask stack of pad oxide (31) nitride (32) and an oxide mask layer (34) on a substrate (30). The mask is patterned so that it blocks one region while exposing another, trenches are formed by etching, a second portion of the first block mask is removed (instant application claims 1 and 12, step d: "removing said blocking layer"), and a second trench is etched while simultaneously etching the first trenches deeper (figures 7-9). Thus a single mask is used to define all trenches (apertures). The trenches are filled with isolation (50) and the isolation sidewalls are aligned with the outer edges of the top patterned masking layer (figure 11 of Chan and figure 8 of the instant application. Chan teaches this process to fabricate trenches of different depths in the same etching step (column 2 lines 21-23), thus a method to reduce complexity of the overall process.

It would be obvious to one skilled in the requisite art at the time of the invention to modify Verret by using a single (critical) mask to produce both the deep and shallow trenches (apertures) in which the isolation sidewalls are aligned with the mask layer as taught by Chan to produce trenches or apertures of different depths and reduce the complexity of the overall process (Verret column 2 lines 1-2, Chan column 2 lines 21-23)

3. Claims 4 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Verret (US005298450A) in view of Chan (US006207534B1) as applied to claim 1 and 12 above, and further in view of Divakaruni (US006150212A).

Verret and Chan teach all of the positive steps of claims 4 and 15 except for using a hard mask of silicon or boron doped phosphorus glass (BPSG). Divakaruni teaches using a hard mask of TEOS (claim 4) or BSG (20 and 22) on the pad oxide and nitride layers to initially form trenches and then BPSG or BSG as a mask to re-etch the trenches when deepening them.

It would be obvious to one skilled in the requisite art at the time of the invention to modify Verret and Chan to include TEOS or BPSG as the hard mask with reasonable expectation of producing trench structures with secondary etching to deepen the profile (Verret, Chan, Divakaruni).

Response to Arguments

4. Applicant's arguments with respect to claims 1 and 12 have been considered but are moot in view of the new ground(s) of rejection.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to David S. Blum whose telephone number is (703)-306-9168 and e-mail address is David.blum@USPTO.gov .

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead Jr., can be reached at (703)-308-4940. Our facsimile number for Before-Final Communications is (703)- 872-9318 and for After-Final Communications is (703)- 872-9319. The facsimile number for customer service is (703)-872-9317. Our receptionist's number is (703)-308-0956.

David S. Blum

February 21, 2003